



National Aeronautics and
Space Administration
Cosmic Origins
Program Office



Cosmic Origins Program Update

Dominic Benford

Chief Scientist, Cosmic Origins Program Office

COPAG Workshop

January 6, 2013

Deputy Chief Scientist: Susan Neff

Program Executive: John Gagosian

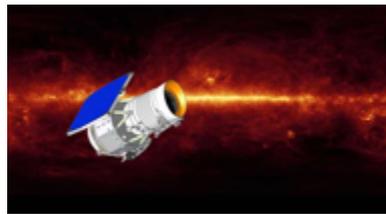
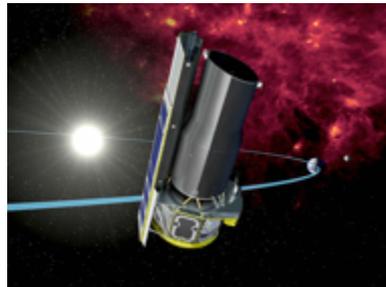
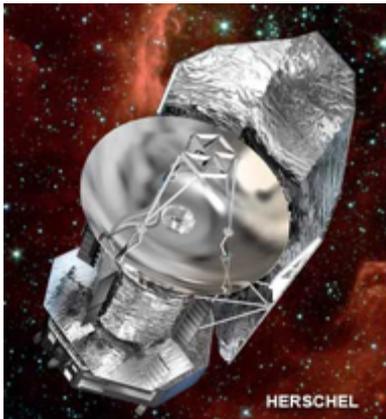
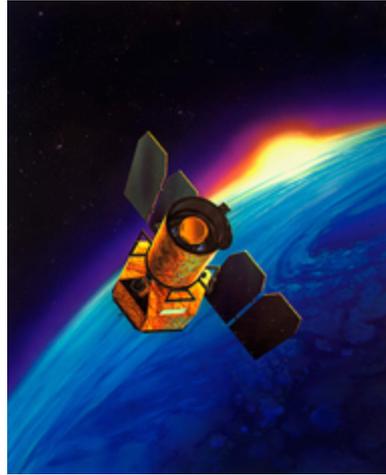
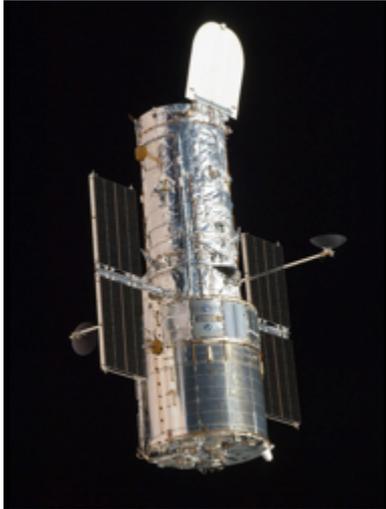
Program Scientist: Mike Garcia

Deputy Program Scientist: Mario Perez

- Program Office Description
- Activities

- The Cosmic Origins (COR) Program has as its prime question “How did the universe originate and evolve to produce the galaxies, stars and planets we see today?” Under this very broad umbrella, some topic areas are:
 - Understanding when the **First Stars** in the universe formed, and how they influenced the environments around them.
 - How did Dark Matter clump up in these very early times, pulling gas along with it into dense concentrations that eventually **Form Galaxies**?
 - How did **Galaxies Evolve** from the very first systems to the types we observe "in the here and now," such as the Milky Way in which we live?
 - **Galactic Nuclei** Host Supermassive Black Holes, and we wish to understand when in the early universe they first formed and how they have affected the lives of galaxies in which they reside.
 - What are the mechanisms by which **Stars Form**, up to and including the planetary systems that frequently accompany them?

Already



Upcoming



*Future missions:
in UV
Far-IR
Explorers*

*Technology Developments,
et alia...*

- The Program Offices act as an implementation arm of Headquarters:
 - **Stewards the PCOS & COR science objectives** by: supervising early concept studies, maturing enabling technologies, monitoring science goals during project and program implementation, and advocating within the larger community
 - **Provides programmatic support** and oversight for missions from earliest concept phase through on-orbit operation and decommissioning including technical expertise, guidance, and independent assessments.
 - **Collects information from and disseminates information to the community**
 - **Manages a portfolio** of operating missions, missions in development, mission concept studies, and technology development to achieve the COR & PCOS science objectives.
- Co-located and coordinated together; located at Goddard; jointly supported by an Advanced Concepts & Technologies Office (ACTO)

COR Program Office Leadership



Program Manager: Mansoor Ahmed (Mooni)[†]

Deputy PM for Missions: Thomas Griffin[†]

Deputy PM for Investments: Mark Brumfield[†]

Chief Scientist: Dominic Benford

Deputy Chief Scientist: Susan Neff

Chief Technologist: Mark Clampin[†]

Technology Manager: Thai Pham[†]

[†] = Shared with PCOS

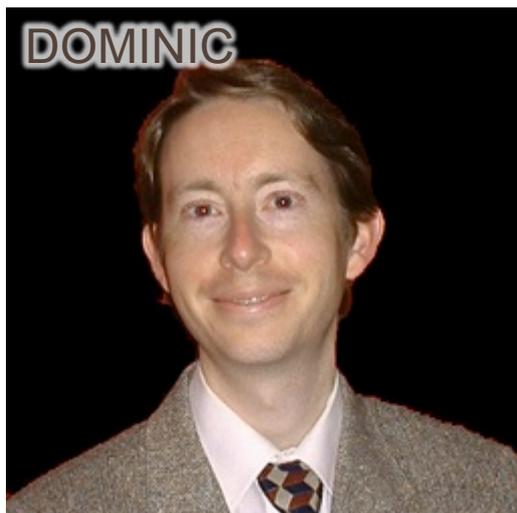


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- Program Office Description
- **Activities**

- COR Program Office has worked with JAXA to understand and preserve allocations for a potential U.S. instrument; considered alternatives
- NWNH: *“In the event that insufficient funds are available to carry out the recommended program... this reduced budget scenario would not permit participation in the JAXA-SPICA mission”*
- Dec 2012: AOs for MoO and associated APEXUSPI were only near-term opportunities for US involvement



National Aeronautics and Space Administration

UV/Visible Science Objectives Request for Information

The National Aeronautics and Space Administration (NASA), through the Astrophysics Division and its Cosmic Origins (COR) Program, are soliciting information through this Request for Information (RFI) pertaining to potential ultraviolet (UV) and visible astrophysics science investigations. Specifically, NASA seeks information that can be used to develop a cohesive set of science goals that motivate and support the development of the next generation of UV/Visible space astrophysics missions. Information may include broad science goals, justifications for investigations that support COR science goals (see, e.g., <http://cor.gsfc.nasa.gov/>), specific measurements or proxy observing plans for well-defined astrophysical experiments, or any aspect of scientific inquiry in the UV/Visible that supports the above COR goals.

Visit <http://cor.gsfc.nasa.gov/RFI2012/>

RFI Forum for Questions #1 Telecon and WebEx	Wednesday, June 6 4P.M. EDT / 1P.M. PDT
RFI Forum for Questions #2 Telecon and WebEx	Tuesday, July 17 4P.M. EDT / 1P.M. PDT
RFI Responses Due http://cor.gsfc.nasa.gov/RFI2012	Friday, August 10 5P.M. EDT / 2P.M. PDT
RFI Discussion Workshop Meeting with WebEx	Tuesday, September 18 STScI / Baltimore

UV/Visible Science Objectives Request for Information
Executed by NASA's Cosmic Origins Program Office



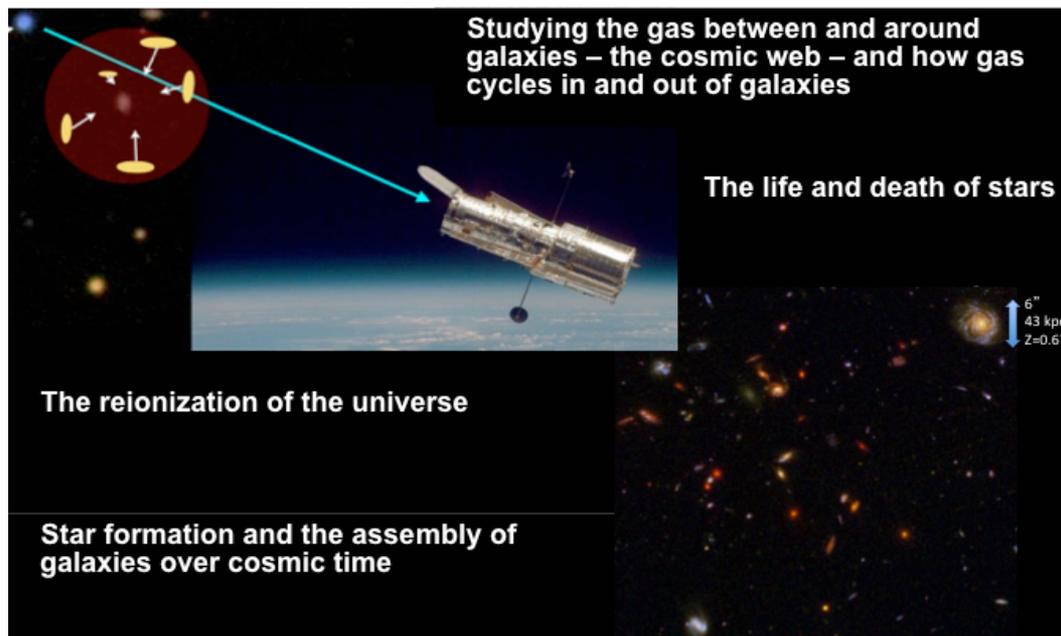
- Community-wide study for science goals has been underway
- Much discussion coming up today: Paul Scowen to kick off
- Next step likely more focused technology development

- Goal is to be prepared to start a new strategic Astrophysics mission to follow JWST while continuing to advance the science during the interim.
- Begin new, strategic mission in 2017, subject to funding availability; responsive to the recommendations of the Decadal Survey.
 - Cannot assume large mission
 - Concepts for moderate cost missions that cost \lesssim \$1B must also be considered
 - Concepts being studied derive from science objectives of NWNH prioritized activities
- Progress on NWNH science and priorities maintained through: sustaining and enhancing core research program; continued operation of existing missions & GO programs; growing use of the suborbital programs; & more frequent Explorer opportunities.

Strategic Mission Concepts	Derived from Recommendation	Status of Studies	Candidate Plan(s) for Future Mission
WFIRST: Large Strategic Mission (DRM1)	Large 1st : WFIRST	Completed in 2012	Large mission for mid- decade
WFIRST: Probe-size Strategic Mission (DRM2)	Large 1st : WFIRST	Completed in 2012	Probe for mid-decade
Use of 2.4m telescope assets to advance science of WFIRST	Large 1st : WFIRST (Medium 1: New Worlds Technology)	Started in 2012	Large mission for mid- decade
Gravitational Wave missions to advance science of LISA	Large 3rd : LISA Technology	Completed in 2012	Large mission for next decade; international partnership
X-ray missions to advance the science of IXO	Large 4th : IXO Technology	Completed in 2012; under consideration for study in 2014	Probe for mid-decade; Large mission for next; international partnership
Exoplanet probes to advance the science of a planet characterization and imaging mission	Medium 1st : New Worlds Technology	Planned for 2013; SDT opportunity just announced	Probe for mid-decade; large mission for next decade
Cosmic Microwave Background Polarization Probe	Medium 2nd : Inflation Probe Technology	Study under consideration for study in 2015	Probe or large mission for next decade
Science + technology drivers for a UV/Visible mission	Small: (Definition of) a future UV- optical space capability	Started in 2012	Probe or large mission for next decade

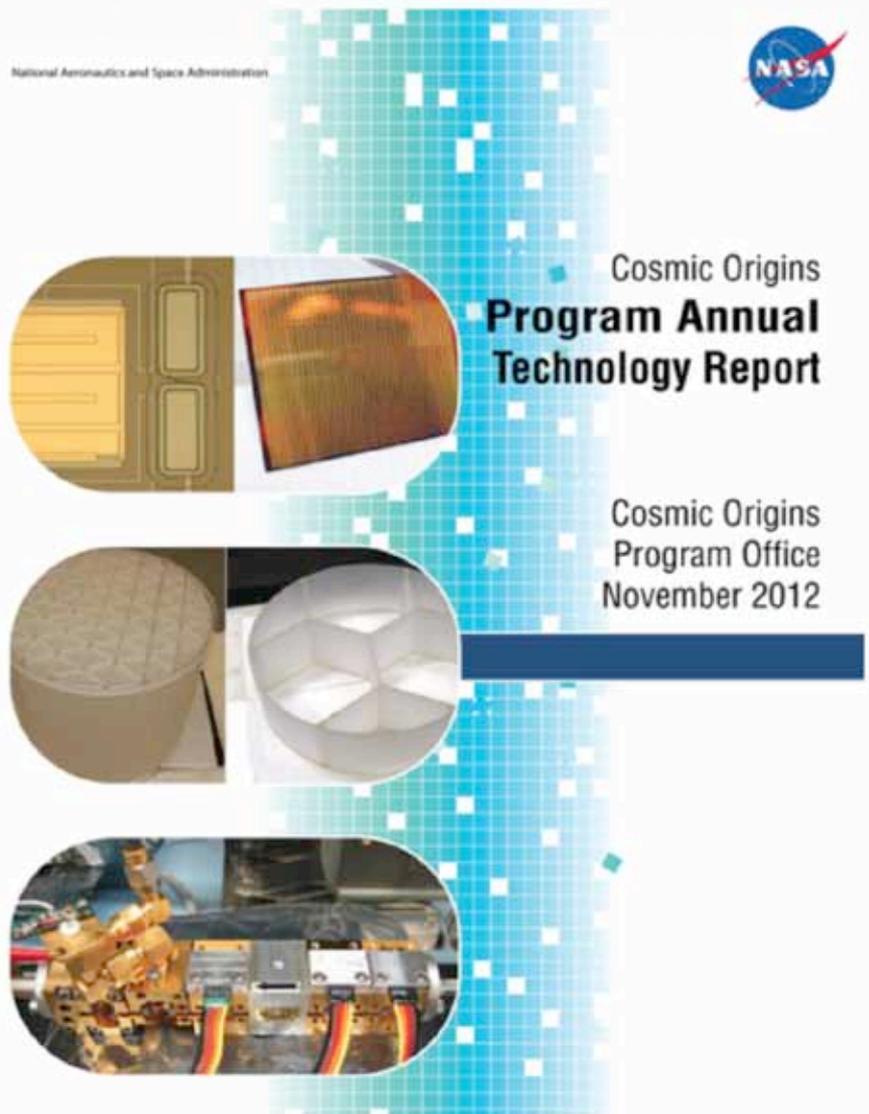
- **NASA must plan future mission to dispose of HST**
 - Natural orbit decay of HST will cause uncontrolled reentry NET ~2025
- **COR Program Office conducted a comprehensive HST Disposal Study in FY11/12**
 - GSFC Architecture Design Lab worked with HST Core Team to develop trade space, conduct reliability analysis, quantify schedule and cost, select an optimal approach, and evaluate key enabling technologies.
 - Aerospace Corporation performed high-level risk assessments and cost trades for several possible mission architectures
 - Identified potential partnership options to reduce cost to SMD
- **Considered 3 Disposal Approaches**
 1. Deorbit into Pacific using chemical propulsion
 2. 1200 km storage orbit using chemical propulsion
 3. 2000 km storage orbit using solar electric propulsion (SEP)
- **Cost will run at about \$500M, including reserve**
 - Pre-Phase-A activities to start no earlier than FY 2017

- ‘UV-Visible Inception Study’ – an internal study as an extension of the Hubble Disposal mission study. FY12.
- Idea: use 2.4m telescope asset + Hubble Disposal to reduce cost but provide continued UV capability. Only mature technologies; “low” cost. Submitting to SALSO.



A Hubble-class telescope equipped with highly capable instruments in the UV/visible would address a wide range of science questions. Potential instruments:

- Lyman-UV spectrometer
- Wide-field UV/vis imager
- Multi-object spectrograph



- Contains status of COR-funded technology developments
- Provides new technology needs prioritization.
- Available online!
<http://cor.gsfc.nasa.gov>

- Articulate the key drivers for SOFIA science, future UV/Visible Observatory, & future Far-IR Observatory
 - Science Requirements
 - Technology development needs
 - Timeliness
- Identify alternative mechanisms for achieving COR science goals
 - Suborbital concepts
 - Coordination with ground-based facilities
 - Technology leading to Explorers, etc.
- Identifying important areas for future SAT calls